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Earth and Water Make More Than Mud

A Monograph
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First Term AY 89/90

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Advanced Military Studies, USAC&GSC 6b. OFFICE SYMBOL (If applicable) ATZL-SWV	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Fort Leavenworth, Kansas 66027-6900	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
Earth and Water Make More Than Mud (U)

12. PERSONAL AUTHOR(S)
Major Randall R. Hill, USA

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Monograph	FROM _____ TO _____	90/01/10	55

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	obstacles, Iran-Iraq War, barrier, terrain usage, Roer River

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This monograph addresses the viability of the concept of creating massive terrain obstacles, and if our doctrine adequately supports the concept. It is written from the perspective of a maneuver planner focusing on mid and high-intensity conflicts, and seeking ways to offset the numerical inferiority our forces may well face in such situations.

First examined in this study are the theoretical foundations for the military use of terrain. Then two historical examples of the creation and exploitation of large terrain obstacles are presented to assess the feasibity and effectiveness of the concept. This is followed by a look at current Army countermobility doctrine and an analysis of its adequacy in supporting this concept.

The author concludes that the concept is valid and useful in the context of AirLand Battle, but that current doctrine, while possessing the foundational parts to support the concept, is not sufficiently integrated and developed for the concept to be used to its fullest potential.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL MAJ Randall R. Hill	22b. TELEPHONE (Include Area Code) (913) 684-2138 / 22c. OFFICE SYMBOL ATZL-SWV

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE

SCHOOL OF ADVANCED MILITARY STUDIES

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Accepted this 26th day of March 1990

ABSTRACT

EARTH AND WATER MAKE MORE THAN MUD--IS OUR DOCTRINE ADEQUATE FOR CREATING MASSIVE TERRAIN OBSTACLES IN DEFENSIVE OPERATIONS?
by MAJ Randall R. Hill, USA, 55 pages.

This monograph addresses the viability of the concept of creating massive terrain obstacles, and if our doctrine adequately supports the concept. It is written from the perspective of a maneuver planner focusing on mid and high-intensity conflicts, and seeking ways to offset the numerical inferiority our forces may well face in such situations.

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I. Introduction

Throughout the history of warfare man has used obstacles, both natural and of his own creation, to enhance his fighting capabilities. In general, obstacles have most often been used in defensive fighting. Like most human competitive endeavors, the successful employment of obstacles has been dependant upon the skill and imagination of the employer and the capabilities of the opponent.

This monograph is concerned with U.S. Army doctrine for the creation and exploitation of large terrain obstacles in defensive operations. In this document, a large terrain obstacle (or massive area obstacles as one manual describes them)(1) is one created primarily by flooding, which can affect the shaping of the battlefield at the highest tactical levels, division and corps. It is hydraulic warfare so to speak, the impact of which may reach beyond the tactical and into the operational level. An example of such an obstacle would be the intentional flooding of a large area to help secure a defensive position.

The focus is therefore at a level above the type of obstacles that most maneuver units create--tank ditches, minefields, abatis, etc.--that are executed at the lower tactical levels, primarily battalion and brigade, to canalize the enemy and delay him in engagement areas. These obstacles are essential, but are manpower and supply intensive, and are limited mainly to the close battle. The massive area obstacle is intended to have a greater impact

on the enemy by reinforcing natural obstacles. Ideally it is executed using fewer resources, and can be employed in deep battle operations. The intent of this study is to show the value of the idea, and to analyze the adequacy of our doctrinal literature to support its execution.

That such a concept would be a valuable tool became apparent to the author during Staff College and Advanced Military Studies tactical exercises, when the successful delay and interdiction of second echelon divisions and armies into and within the main battle area proved to be a task with little tolerance for planning or timing errors and low probability for success. While such exercises cannot replicate with complete accuracy the levels of disruption in command/control and movement that may actually occur as a result of U.S. (or enemy) actions, they do expose the difficulty of effectively synchronizing the assets available to division and corps--even when in the safety of the classroom with near-perfect communications.

To conduct this analysis, the effort will begin with a look at what theoretical base may exist for this doctrine. Following that, historical examples of the use of massive area obstacles will be presented to assess the effectiveness of the concept, then a discussion on how the concept can be used within the AirLand Battle framework.

Having established a background for the subject, the focus will then shift to current Army doctrine on the creation and exploitation of large terrain obstacles.

Aspects to be considered are:

--What is the current doctrine?

--Does it adequately address the subject?

--Is it systematic and integrated with AirLand Battle doctrine?

--If deficient, what are the ramifications of the deficiencies and how can they be corrected?

To conclude, the author will attempt to answer the inevitable "So What?" How this concept can fit in with and enhance AirLand Battle Doctrine will be explored and recommendations for doctrinal improvements presented.

II. Theoretical Background

> And therefore I say: Know the enemy, know yourself; your victory will never be endangered. Know the ground, know the weather; your victory will then be total.
>
> Sun Tzu (3)

Since this study is an analysis of doctrine, it is useful to see whether the doctrine recognizes and incorporates established theories. The incorporation of theory may be an indicator of the validity and usefulness of doctrine.

Throughout history, the one thing that military leaders may universally agree on is the significant impact of terrain on military operations. But how best to use terrain and how significant its impact are points of greatly divergent opinion. While a great many military historians and theorists have written on the subject, the

three considered in this study, Sun Tzu, Antoine Jomini and Carl von Clausewitz have probably been the most influential.

As indicated by the quote, Sun Tzu obviously considered the impact and use of terrain to be of the utmost significance, and therefore included it as one of the five factors to be considered in the estimate of a war situation. (3)

> Conformation of the ground is of the greatest assistance in battle. Therefore, to estimate the enemy situation and to calculate distances and the degree of difficulty of the terrain so as to control victory are virtues of the superior general. He who fights with full knowledge of these factors is certain to win; he who does not will surely be defeated. (4)

To better classsify terrain and describe its impact on military operations, he developed five categories: entrapping, indecisive, constricted, precipitous and distant. (5) In describing the use of constricted terrain, Sun Tzu brings out the possible use of obstacles: "If I first occupy constricted ground I must block the passes and await the enemy." (6)

Sun Tzu also describes nine varieties of ground in his writings: dispersive, frontier, key, communicating, focal, serious, difficult, encircled, and death. The group of six tends toward a tactical focus, the latter toward a strategic view, with some redundancy between the two groups. Both groupings stress the significance of terrain and the requirement for the commander to use it to its fullest potential.

Many centuries after Sun Tzu, Baron Antoine Henri Jomini sought to develop principles and rules of war which could aid in the understanding and conduct of war. Writing in the Napoleonic period, Jomini's perspective on geography was primarily from the strategic point of view, but his concepts are applicable at the tactical level. Most important here, is his concept of the "strategic decisive point(s)...which are susceptible of exercising a notable influence, whether upon the whole of the campaign, or upon a single enterprise." (8)

He further refines his theory of decisive points by separating geographical decisive points, those which are permanent and derive their importance from their terrain configuration, from those points which derive their significance from the relative positions of the two opposing forces. More concisely, Jomini summed up this aspect of his theory as follows:

> The decisive point of a field of battle is determined:
> 1. From the configuration of the ground;
> 2. From the combination of the localities with the strategic aim of an army.
> 3. From the positions of the respective forces. (9)

Carl von Clausewitz wrote, "Only three things seem to us to produce decisive advantages: surprise, the benefit of terrain, and concentric attack."(10) Clausewitz' consideration for the significance of terrain was such that it was a dominant factor in his argument for the primacy of the defense since

> ...it is the defender who primarily benefits from the terrain. His superior ability to produce surprise by virtue of the strength and direction of his own attack stems from the fact that the attack has to approach on roads and paths on which it can easily be observed; the defender's position, on the other hand, is concealed and virtually invisible to his opponent until the decisive moment arrives. (11)

> ...the defense...will always be certain of having the benefit of terrain, and this will generally ensure its natural superiority. (12)

Clausewitz also developed in his writings the concept of the "center of gravity" which is the "hub of all power and movement". He most often refers to a belligerent's army as his center of gravity, but does recognize that other things--abstract or concrete--can be centers of gravity. (13) The center of gravity theory can be extended to terrain when it provides the possessor the basis for his power.

While all three of these great theoreticians have utilizied different approaches in addressing the impact of terrain, all have the same appreciation for the magnitude of its impact on military operations and the necessity for using the terrain to its fullest potential.

III. Historical Examples

The Roer River Dams

One of the best historical examples of a massive area obstacle was the German use of the Roer River dams in World War II. As the American drive approached the German West Wall it stalled for logistical reasons. But even after supply problems were reduced, progress remained slow

throughout the winter of 1944-45 for several other reasons. A significant factor in this was the presence of the Roer River dams.

There were seven dams (three of which were on Roer River tributaries) located in the vicinity of Schmidt near the Huertgen Forest, scene of exhaustive and frustrating U.S. offensive efforts. (See maps, pages 45 and 46.) The principal dams were the Schwammenauel, on the Roer about three kilometers southeast of Schmidt, and the Urfttalsperre, on the Urft River between Gemund and Ruhrberg. These two dams were to regulate the Roer River and provide hydroelectric power. The other dams were primarily to regulate the river levels. The Urfttalsperre, a concrete dam capable of impounding 45.5 million cubic feet of water, was militarily valuable for controlling the level of water behind the Schwammenauel Dam downstream. The latter was an earthen/concrete dam capable of holding 100.7 million cubic feet of water. If the Allies were to destroy the dams, the most feasible method would have been to create a breach in the Schwammenauel, then destroy the Urfttalsperre upstream and let the erosive effect of the released water complete the destruction of the Schwammenauel Dam. (14)

The significance of these dams did not immediately dawn on the Allied planners, although they were present on all planning maps and information on them was readily available from a variety of sources. (15) On October 2, 1944, a

division G-2 in the U.S. First Army warned of the potential impact on crossing operations downriver should the Germans decide to destroy the dams. He reported that forces could be isolated and tactical bridging destroyed by flooding that would extend into Holland, exposing the forces east of the Roer River to the risk of complete isolation and subsequent destruction.

Allied plans were not immediately changed and the Huertgen Forest offensive began with little or no attention paid to the dams, control of which should have been the primary military objective in the European theater at that time. First Army's intelligence assessment after the subject was raised, was that if the German's destroyed all the dams, "...they would cause at the most local floodings for about 5 days counted from the moment the dam was blown until all the water had receded."(16) Two days later they cautiously revised this estimate to say that flooding might be more widespread.

On 20 October, the Supreme Headquarters Allied Expeditionary Forces (SHAEF) G-2 began to exhibit more concern regarding the dams based on a report received from V Corps (First Army) G-2. The report was the result of an interrogation of a prisoner captured in Dueren, who said that the persistent ringing of the church bells was to be the signal that the dams had been blown. The people were to evacuate Dueren since flood depths there were expected to reach twenty feet.(17)

Still immediate action was not taken. It should be noted that the reservoirs were about one-third to one-half full at this time, and that the Germans did not begin to raise the water levels until November, which was about the time that both First Army and Ninth Army (whose sector was further down river) as well as SHAEF Headquarters began to display serious concern about the dams.

On 11 November, both First and Ninth Armies issued orders stating that troops were not to advance beyond the limits of the Roer River. On 18 November, General Hodges, the First Army Commander, began studying the potential for destruction of the dams by the air force. Four days later he sent a request to SHAEF for the dams to be bombed. By the end of the month, the request resulted in the British RAF being tasked to try to destroy the bridges. Skeptical, the RAF nevertheless flew several large-scale missions against the dams, but with no success. By mid-December, the air force effort was called off and First Army began to plan for a ground attack on the dams.

It is noteworthy that for two months, two Allied armies had been fighting to reach the west bank of the Roer River and build up forces without making any specific effort to capture the dams. Until that was done, neither army could progress. (18)

It is also interesting to note how the potential of this massive area obstacle colored intelligence estimates on the build-up of German forces in the Ardennes. Both

sides recognized that as long as the Germans held the dams, they had the ability to conduct an economy of force below the dams, gaining forces for use elsewhere.(19) General Bradley thought the Ardennes build-up was intended for a counterattack when the Allies were straddling the Roer.(20) Even as the German offensive unfolded, General Hodges at First Army thought it was "merely a spoiling attack to disrupt the drive for the dams, and he did not intend to dance to the Germans' tune."(21)

It is quite conceivable that, once recognized, the impact of the dams created a "target fixation" in the Allied commanders, thus aiding the German deception plan for the Ardennes counteroffensive. It is also conceivable that if the Allied commanders had recognized the significance of the dams early on and focused operations on securing them rapidly, the Germans would not have had time to execute the build-up of forces for the counteroffensive.

As it was, the Battle of the Bulge and other problems forced the Allies to postpone operations to secure the dams until 2 February, when V Corps was given the mission to secure the dams as First Army's main effort. The deadline to accomplish the mission was 10 February, the start date for the Ninth Army's offensive across the Roer River below the dams (OPERATION GRENADE).

The Americans succeeded in securing the dams late in the night on 9 February in an action that was a bit anticlimactic. There was little resistance at the

Schwammenauel dam by the Germans and no attempts were made by them to blow-up the dam. However, by the time the Americans arrived the damage had been done. Water had been diverted from behind the Urfttalsperre to below the Schwammenauel where they had destroyed the power machinery and discharge valves. (22)

The effect was not a deadly flood wave, but a continuous flow of water that rapidly swelled the Roer from its normal state of 20-30 meters wide and two to five feet deep to 1,000-1,500 meters wide and up to twelve feet deep. (23) American operations were postponed initially until 17-18 February, but the conditions on the west bank of the Roer River were not sufficiently improved until 23 February for the offensive across the Roer River to begin. Even then,

> Obstructions and inundations, worsened by the February thaw, forced the heavy attack to clot along the only two paved roads that were available and contributed at least as much as the enemy's active defenses to preventing the Allied concentration of power from generating a breakthrough. (24)

The Germans utilized the period of the flood to shift forces north to oppose the obvious areas for the resumption of the Allied offensive. (25) The Allies eventually succeeded, for by then German manpower and equipment was greatly depleted. But the rapid breakthrough the Allies had hoped for was reduced to a slow grind.

The Roer River example provides us with several points relevant to this study and to current doctrine. First, the

German defensive use of the dams validates the theoretical aspects of Jomini and Clausewitz discussed earlier. The dams were definitely decisive points meeting all three elements of Jomini's definition, and certainly exercised a "notable influence" on the whole of the campaign.(26) The dams also met Clausewitz's center of gravity criterion, since they were an obvious source of great defensive power for the weakened German forces.

Second, the Roer River action displays how a natural obstacle can be reinforced to create a massive area obstacle with a tactical, and in this instance operational, impact that far exceeds the time and effort expended. With the dam already existing, the Germans expended virtually no manpower or effort to create the obstacle. Substantially outnumbered and outgunned, the Germans were able to maintain the defense of the Roer River line for over three months by the threat of and the actual flooding. In doing so, they gained the time to build and move forces to the Ardennes to stage one last alarming counteroffensive. Thus, the obstacle provided longevity and durability to the German defense.

Third, once the Allies did begin to cross the Roer, the after-effects of the flooding restricted their avenues of approach and maneuver to and from the river, allowing the Germans to concentrate their forces and further delay the Allied advance.

Fourth, if the German Luftwaffe had been capable of conducting more extensive operations, the concentration and fixing of the Allied forces by the obstacle would have provided the lucrative and relatively static targets ideal for air interdiction. Fortunately, the Luftwaffe was virtually impotent, and the Allies could concentrate forces with minimal air interference. Given current methods of air interdiction and targeting, the ability to fix a maneuver force in the manner that the Allies were, greatly increases the probability of successful attack.

Finally, the failure of the American commanders to recognize the significance of the dams earlier may have stemmed from the lack of consideration the subject was given in the doctrine of the time. Inspection of the 1941 version of FM 100-5 reveals the failure then, like present, to recognize the significance of large area obstacles. Even after the war experiences, U.S. doctrine in the 1949 FM 100-5 did not reflect the impact of obstacle operations such as those conducted in the Roer River Valley.(27)

The Iran-Iraq War

The Iran-Iraq War presented some interesting aspects of engineer operations. First, in a war which most envision as a desert struggle, water obstacles coupled with terrain excavations were extensively used. Second, the tactical obstacle network created by the Iraqis clearly reflected the strategic decisions of the Iraqi president, Saddam

Hussein. Both the strategy and the tactics reflect the impact of geography.

Understanding the strategic geography is necessary for understanding the tactics and the obstacles used. Iran possesses strategic depth, with most of its important cities and resources located a substantial distance from the border with Iraq. In sharp contrast, most of Iraq's key centers--Basra, Baghdad and the Kirkuk oilfields--are close to the Iranian border. (See maps, pages 47 and 48.) One of the key war aims of President Hussein was to gain a territorial security belt.(28)

The terrain in the southern sector of the Iran-Iraq border, which is the area focused on here, is a very flat, lowland plain interlaced with channels from the Tigris and Euphrates Rivers and the Shatt al-Arab waterway. There are extensive marshes, some of which exist year round, as well as extensive irrigation canals and flood-control levees. The desert portion of the region consists of fine sand, which also inhibits vehicular traffic. The Iraqis countered this problem by spraying the roads with liquid tar which set and bound the sand forming a reasonably solid road surface. In general, the terrain favors the defender throughout the southern region, parts of which are virtually impassable by ground vehicles.(29)

Iraq launched the war on 22 September 1980. Within a week, President Hussein announced that Iraq's territorial goals had been attained and that he was willing to

negotiate. The Iraqi army and air force had been successful largely because they had been opposed by poorly organized militia forces. The majority of the Iranian army was located in the country's interior away from the borders, thus being spared a potential defeat.(30)

Iran's response to the Iraqi offers of negotiations was to escalate the war, attempting to attack Iraqi cities. Within two weeks of its beginning, what had started as a limited dynamic war had become a static, general war.(31) Iraq, content with its territorial gains, began to dig in and fortify to secure the territory thus gained, showing no inclination for further attacks.

In general, the character of the land war for the next eight years had been set. Iraq would hold well developed defensive positions capitalizing on its armor and air superiority, while Iran, whose air force and mechanized assets were rapidly reduced to insignificance, mounted repeated offensives utilizing World War I style mass infantry tactics supported by artillery.(32)

Iraq's decision to use positional tactics was driven not only by geography and strategic goals, but by its population disadvantage. Iran had a population three times larger than Iraq (45 million versus 15 million), and the willpower to commit every male to combat if need be. Further, Iraq's Saddam Hussein is a minority leader whose political position was, and still is, rather tenuous.

Heavy casualties would have been an unacceptable political risk. (33)

The impact of these factors on Iraqi tactics was to raise engineer operations to a dominant position. However, it was the Iranians who first began the engineer war, utilizing water barriers to stop the Iraqi drive on Abadan, and creating floods to channel the Iraqis onto a limited number of approaches, forcing them to expend extensive engineer efforts to either continue the attack or assume the defense. (34) The Iraqi counter to this was to build elevated roads and earthen walls to protect against flooding, and to begin building fortifications that were anchored on and utilized water wherever possible. (35)

The largest and most significant of the barriers constructed by the Iraqis was to protect the key city of Basra, a frequent objective of Iranian offensives. Originally, it began as a large trench across the desert some six miles east of Basra sufficient to block infantry passage. By 1983 it had expanded into a lake 24 kilometers long and one kilometer wide, branching out at its southern end to 10 kilometers wide (see map page 48). It was created by digging extensive canals, then pumping billions of gallons of water from the Tigris River and the Hawizah Marshes. (36) Named Fish Lake, it served as a hub of Iraqi defensive efforts in the southern region. Iranian forces on occasion infiltrated across and around the barrier, surprising the defenders, but were never able

to gain sufficient strength across the obstacle to control both sides of it for long.(37)

North of Fish Lake and Basra is another area that was critical in the war, the Hawizah Marshes. Mostly a part of Iraq, they are critically important for the roughly 27 billion barrels of oil below them--about one-sixth of Iraqi oil reserves. The marshes restrict vehicular movement to a few elevated roads and the tops of levees, thus reducing Iraq's mobility and armor advantage. The high levees and soft soil provide excellent protective cover for infantry from both tanks and aircraft.

To counter this, the Iraqis heavily fortified the area, built high guard towers with night vision devices and cut down the tall vegetation in an effort to detect and block against the frequent and often large-scale Iranian infiltrations. In February and March of 1984, the Iranians poured thousands of troops into an offensive in the region (Operation Khaybar) and succeeded in gaining control of much of the marsh lowlands. The Iraqis attempted to drown their enemy by diverting water from the Tigris River to create a flood. The Iranian counter was to use their manpower advantage and dig a drain canal to the Kharun River 60 kilometers to the east.(38)

A more successful Iraqi effort was to lay electric cables into the low, watery areas held by the Iranians. The options for the Iranians were electrocution, or move to

the high-ground and face Iraqi air, armor and artillery fire. (39)

An appreciation for the significance of these defensive measures can be gained by considering the number of offensives the Iranians launched in the Basra and Faw Peninsula area. Between 1982 and 1987, at least a dozen Iranian efforts were made in the southern region, some of which had up to 200,000 men participating with actual assault forces exceeding 120,000. While some of these offenses gained limited bridgeheads into the Iraqi sector, none were long standing and Iranian losses were always significantly heavier than the Iraqi defenders. (40) Since both sides in this war consistently lied about the extent of casualties, gains made and the size of forces involved, it is difficult to give precise details on operations.

The tactics utilized by the Iraqis were far from being operationally brilliant. But given the manpower disadvantage they faced, the fanatacism of their opponent, and their own operational and tactical weaknesses, the Iraqi resort to defensive engineering proved to be a lengthy but successful tactic in this long war of attrition.

The operational methods utilized by the Iraqi forces is not a style of warfare that the U.S. Army should try to emulate. Still, the Iran-Iraq War contains some relevant lessons.

First is the tremendous impact of geography on both tactics and strategy, validating the theories of Clausewitz, Jomini and Sun Tzu. The efforts of the Iraqis in particular demonstrate that defensive decisive points can be created by the development of large area obstacles such as Fish Lake.

Second, it shows how large-scale terrain reinforcement and obstacle integration can add longevity and durability to the defense. Although outnumbered and manning a long front, the Iraqi defensive obstacles and prepared positions allowed relatively small forces to hold sectors until reinforced by mobile units. The obstacles also provided depth to the Iraqi defenses in the narrow southern region between the key city of Basra and the border.

Third, it demonstrates the potential of large-scale terrain and water obstacles even in the desert. Most key facilities to be defended will be near some permanent source of water that may be useful in defensive obstacles.

Fourth, it demonstrates the extreme value of engineer equipment on the battlefield. One Iraqi corps commander considered engineer equipment to be of such value that he organized special patrols to capture and destroy Iranian earth-moving and bridging equipment. Such captured equipment was displayed as trophies of far greater value than enemy tanks. (41)

Finally, the war demonstrated that even armies equipped with modern weapons may lack the tactical and operational

expertise to conduct maneuver warfare. U.S. contingency forces could well be faced with opponents or allies that will resort to this style of warfare.

IV. Use In AirLand Battle

Any concept for military operations put forth for U.S. use must be compatible with AirLand Battle doctrine. This section will consider how the concept of massive area obstacles can be used within that framework.

It is easiest to view the application of this concept in terms of the deep and close battles, and what the desired impact on the enemy is. Let us consider first the purpose of the deep and close battle within the defensive framework.

According to FM 100-5, defensive deep operations are essential and are

> ...the commander's means of ensuring the success of his decisive engagements and counterattacks by limiting the enemy's options, disrupting his coordination, and affecting the closure times of his follow-on elements.
>
> They continue against follow-on or uncommitted forces to isolate combat in the security area and MBA, to guard against interference with the commitment of reserves, and to shape the conditions of the next set of defensive engagements. (42)

Thus, the intent is to disrupt his echelons, prevent the synchronized arrival of critical elements, and meter the flow of forces into the close battle where the enemy can be destroyed and defeated by defensive operations and counterattacks.

A massive area obstacle could be used to block the

initial echelons of an enemy force, provided the terrain at the forward edge of the battle area supported one. This would give time for improved deployment of friendly forces and additional time for diplomatic negotiations. The drawback in early execution of the obstacle, before the enemy is extensively deployed, is that it provides him the opportunity to keep his forces in covered and concealed locations while preparing alternate plans.

It is in the disruption of enemy echelons and delaying their movement into the main battle that a massive area obstacle can have the greatest impact. Executed after the lead divisions or armies have closed into the main battle area (MBA), the obstacle would prevent the second echelons from entering the MBA at least until the first echelons were destroyed and friendly defenses restored and/or reinforced. The obstacle would cut off the first echelons from their logistical support and possibly some of their fire support assets, thus helping to expedite their destruction.

A massive area obstacle would obviously disrupt the tempo of Soviet style operations, which stress mass and momentum to achieve success. Soviet offensive operations also require that key elements come into the battle at certain times and places. Lead echelons must achieve a certain level of success, air assault units must be inserted and gain success within a limited time window, and engineer units must arrive at the right points, also within

a specific time frame. Throughout, logistics and fire support must continue. Disrupting any one of these elements may be sufficient to throw off the enemy's timing and success. Cascading disruption may erupt and tactical failures begin to create operational failure. The intent of the deep battle as quoted from FM 100-5 has been achieved.

It is certainly possible to achieve "cascading disruption" without utilizing the massive area obstacle concept, but the odds of success might be much smaller than can be safely accepted. A detailed discussion of a division defending against a Combined Arms Army or of a corps versus a Soviet Front exceed the space available here, so let's simply consider what assets exist at the corps level to create deep battle disruption without creating a significant barrier. Then we will look at how a massive area obstacle could be created to help in the conduct of the deep and close battles.

The primary assets available to a corps for executing deep operations are its aviation brigade, Lance missles, artillery, and targeting input to Air Force operations. The aviation brigade with its attack helicopters can certainly reach deep and do considerable damage to second echelon forces, particularly if it is successful in finding and destroying critical command and control targets. However, the verdict is still out on the survivability of these assets when used forward of the FLOT in deep

operations. Additionally, to get the electronic warfare suppression assets necessary to enhance the survivability of the helicopters requires air force assets. That means long lead-times for planning and coordination, resulting in limited flexibility and little crisis response capability without accepting the substantially greater risk of operating without the EW protection.

Lance possesses the range to influence the deep battle, but the ability to target it effectively against moving forces is very limited, as is its non-nuclear weapons effectiveness. It is better utilized against fixed targets such as critical bridges and chokepoints, but again the effectiveness of its warhead against those types of targets is marginal. It is a system which can provide good short-term harassment and delay, but is unlikely to produce the cascading disruption and substantial interdiction being sought. Additionally, there is always the risk that enemy target acquisition and analysis might mistake a Lance launch for an escalation to the use of tactical nuclear weapons.

Our current generation of artillery is limited by range to affecting only the close battle, which leaves the Air Force as our last asset. Current doctrinal agreements between the Air Force and Army places most of the deep battle targets into the air interdiction category. A corps has no direct input into air interdiction targeting if it is operating as part of a larger organization like CENTAG.

Corps targeting intentions might be reflected in the air interdiction efforts, depending on how the higher commander is viewing the battle and what his priorities are. Corps does have a degree of targeting control on the battlefield air interdiction (BAI) sorties allocated to it. But it is difficult to target aviation against moving forces when the request must be submitted 24 hours in advance of the time-on-target, and shifts in targets or target locations must be made at a minimum of two and one-half to twelve hours in advance. Careful planning of dump targets (secondary targets attacked when the primary target cannot be located or engaged) against fixed assets such as bridges can help to create the disruption, but it will probably not have the same effect as a direct attack on the forces.

In addition to targeting difficulties, the ability of air force assets to substantially delay second echelon forces is again largely dependent on the ability to successfully locate and destroy command and control assets once the enemy force is found. Enemy air defense and counterair operations make this difficult and high-risk, although not impossible to do.(43) Air Force delivery of Gator mines may be an effective means of delaying the enemy, but as of 1986, the $55,000 per dispenser price tag had limited procurement to only 1,500 dispensers. When delivered from an altitude of 200 feet, the Gator dispenser delivers 72 anti-armor and 22 anti-personnel mines into an

area 200 feet wide and 300-400 feet long. Given the volume of mine clearing equipment in Soviet forces, these minefields may prove to be only of nuisance value in the deep battle effort since they can't be covered by direct fire.

Of course these deep battle weapons and forces all have limitations, but when effectively synchronized together as our doctrine calls for, they have a much greater effect. As alluded to in the introduction, it is easy to write that in the doctrine, but very difficult to execute. Given the friction of war, it may be too difficult. Thus the importance of the massive area obstacle concept--to provide the expanded time and space window for synchronizing all of our assets as our doctrine requires. In doing so, the obstacle will provide greater durability, longevity and depth to defensive operations, just as the historical examples have shown.

Assuming then that the massive area obstacle concept is a useful one, how can it be executed? In answering that question, it is important to draw some limits. First, no new weapons or force structure should be necessary; second, execution should not be time or manpower intensive, since both are usually in short supply in U.S. Army operations.

The ideal means of obstacle <u>creation</u> would be the Roer River dam situation where the defensive forces control a dam to create flooding, although it need not be on such a large scale. Control of a dam provides the options of

either a limited, controlled flooding utilizing the dam's flood gates and discharge valves, or destruction of the dam to create both a destructive flood surge and flooded area. Of the two, the first provides the flexibility of controlling the extent of the flooding, limiting the collateral damage and danger to non-combatants, and it may be possible to sustain or repeat the effects if the water levels are sufficient or replenished. The destruction option may require the use of atomic demolition munitions for most dams. In either instance, the intent is to eliminate existing bridges and approaches, and create a obstacle whose width either exceeds the enemy's bridging capability or will force him to use all his bridging assets on one obstacle, inhibiting his ability to cross future barriers.

It is possible to create flood effects in lowlands by expedient damming of streams using conventional or atomic demolition munitions (ADM) to create a mid-stream crater. The earth ejected from the crater will serve as an expedient dam which can be reinforced with other material. Destroying canal locks, creating landslides where rivers run through choke points, and breaching the retaining walls on groups of man-made lakes and ponds are other expedient flooding means. (44)

Flooding is the easiest and arguably most effective means of creating a large area obstacle, and can be further reinforced by integrating other forms of obstacles such as

mines, craters, wire and destruction of the approaching and exiting road network. Soviet writings indicate that they expect NATO forces would use underwater mines, burning fuel on water barriers and controlled forest fires to create other types of large area obstacles. While such activities may be in forward defense plans and would undoubtedly be effective, they are not recognized in our doctrine.(45)

To **execute** these obstacles there are a number of force options. In the deep battle, the covering force engineers and combat units, light infantry operating in a stay behind or area denial role(46), or Special Forces units could execute most methods of flooding. Air Force assets might be able to destroy smaller dams, although such attacks have historically been largely unsuccessful. In the close battle the mission would obviously fall to the engineers supporting the units in contact.

In the close battle, the intent and impact of creating a massive obstacle is much the same as in the deep battle. The primary difference is that execution of the obstacle would most likely be an option that is utilized to prevent a major enemy penetration. It could also be used to gain time to allow the defense to restore itself and possibly regain the initiative. Large-scale obstacles would also be of extreme value in retrograde situations--to gain time in the delay or to allow for a withdrawal to be conducted without enemy pressure.

The defensive benefit to be gained from a large-scale terrain obstacle, however it is created, is greater longevity and durability of the defense. Ideally, the obstacle will separate enemy echelons, disrupt the tempo of his operations, create troop concentrations that can be targeted and engaged more readily, and provide the defender the opportunity to regain the initiative. Now, does our doctrinal literature adequately support the concept?

V. Analysis of Current Doctrine

> Terrain reinforcement and mobility and countermobility improvements are the responsibility of the maneuver commander.
> FM 100-5 (47)

Before beginning a review and analysis of current doctrine, it is worthwhile to consider what is the importance of doctrine, and what specific points should be present in the literature for support of this concept.

Doctrine provides the foundation and framework for all Army activities. Ideally, it is systematic, orderly and not contradictory.(48) All actions conducted within the Army--training, force structure, resourcing, personnel, procurement--should stem from and be in harmony with the doctrine.

In examining the concept of large area obstacles, the literature for maneuver operations and engineer operations should be thoroughly integrated. Based on the discussion of this obstacle concept being utilized within the AirLand Battle framework, the literature should hopefully address

the following points:

--disruption of the enemy's tempo, and delay or blocking of follow-on echelons.

--engineer involvement in deep battle targeting and the conduct of deep battle operations.

--integration of all systems available (Air Force, artillery delivered FASCAM, ADM, standard engineer equipment).

--examples of concept employment and execution, to include general planning factors, time to emplace, and expected results in terms of enemy delay time and effort required to breach the obstacle.

Current U.S. Army doctrine for obstacle planning is found in two categories of manuals--those from the maneuver operations perspective, and those that are engineer specific. This review and analysis of doctrine will begin with the maneuver operations portion, and then address the engineer manuals. How well the two link together will be addressed throughout the analysis.

The capstone manual for conventional maneuver operations is FM 100-5, Operations. Descriptive in nature, the manual dedicates sections to various aspects of terrain effects and obstacle usage. Chapter 5, "Environment of Combat", has a section covering the effects of terrain in which the reader is advised that

> The able commander recognizes the battlefield's natural structure and acts to improve or overcome it as necessary to accomplish the mission.(49)

Further on, the manual covers some points of terrain analysis such as identifying avenues of approach, defensible terrain and dominant features. Of particular relevance to this study is a brief reference to the concept of separating enemy echelons by destroying bridges, blocking defiles or obstructing routes, and that such actions "can isolate enemy positions and create lucrative targets for ground or air attack."(50)

The most prescriptive this section on terrain analysis gets is in the area of terrain reinforcement.

> The proper use of natural obstacles and the reinforcement of terrain must be an integral part of the commander's plan.
> ...Generally, a commander should concentrate his engineer effort in two directions. In one direction, he should develop an obstacle system in depth which enhances his fires and degrades the mobility of the enemy. In the other direction, he should develop covered positions and routes which facilitate the execution of his own scheme of maneuver. (51)

This section also emphasizes the operational use of terrain:

> Terrain analysis, intelligence preparation of the battlefield (IPB), and engineer operations are key to the operational use of terrain. (52)
>
> At the operational level, routes must be built or improved and obstacles and interdiction planned in depth to support the campaign or major operation. (53)

This is true, however, it is a sharp contrast in doctrinal and audience levels to be discussing operational use of terrain in a section of the manual largely dedicated to a simple elaboration of the mnemonic OCOKA. The

simplicity may be the appropriate level for our army, but if that is the case, there needs to be some precise prescriptive doctrine to accompany these operational level concepts. With regards to engineer operations, such doctrinal precision and "how to" is lacking.

Regarding defensive operations, FM 100-5 succinctly states: "Defensive doctrine is not prescriptive."(54) True to the statement, it describes general defensive planning considerations utilizing METT-T as a format, with each element of the acronym simply explained as it relates to the defense.(55)

In the fourteen sentences which mention obstacles or engineers that are scattered through the two chapters on defense, the essence of the obstacle doctrine is:

--plan obstacles in detail.

--use obstacles to disrupt the enemy and prevent his concentration.

--concentrate engineer assets in support of the main effort.

--reinforce natural obstacles with man-made obstacles.

--plan obstacles in depth.

--use obstacles to strengthen defended positions and support maneuver. (56)

As a broad guide for planning obstacles in defensive operations that is acceptable. In terms of "how to", that's not a lot for a planner or a student to hang his hat on, but in a document covering the maneuver operations

spectrum from low-level tactics to theater campaign planning, it may be the most that can be hoped for. But is it sufficient? Does it provide the reader enough information or stimulation that will result in obstacle planning that is innovative and effective?

One notable deficiency is that in the chapters on defense there is no mention of using obstacles to separate enemy echelons and isolate enemy units, an aspect of obstacle use brought out earlier in the manual. Maybe that's being too picky, and simply saying disrupt the enemy and prevent his concentrating forces is adequate. However, that doesn't effectively address or reinforce the powerful part that obstacles can play in the crucial delaying or blocking of follow-on echelons into the main battle area, especially if the situation exists which allows for the creation of a massive area obstacle.

Recognizing that FM 100-5 is a capstone manual, the criticism for lack of specifics may be misplaced. The doctrinal "how to" being sought may be in the manuals FM 100-15, Corps Operations and FM 71-100, Division Operations.

The corps level doctrine for the intent of defensive obstacles is covered in less than one paragraph:

> Terrain and obstacles throughout the corps sector are also used to strengthen ground defenses, protect corps forces, and impede enemy movement. Countermobility operations should concentrate on terrain reinforcement and canalization of enemy forces in accordance with the commander's defensive plan. Care must be taken to locate gaps and lanes to support recovery

> of the covering force and execution of counterattack plans. Flank protection should also be considered. (57)

Obstacle planning at the corps level is also addressed briefly:

> The corps commander places the fewest possible restrictions on subordinate unit freedom to employ obstacles. Divisions usually designate their own obstacle zones, but the corps may designate them when necessary to develop the defense in a particular location, such as along a major river or to structure a salient. More often, the corps directs obstacle restricted areas to facilitate future corps maneuver, such as a planned division-sized counterattack. Obstacle restricted areas impose whatever restrictions the commander deems necessary. These are usually limits on the types of obstacles or the duration of scatterable mines employed by subordinate units in the designated areas. (58)

Use of obstacles in the delay are never mentioned, and in withdrawal operations, the doctrine only states, "Corps engineer units have two basic missions during wihtdrawal--to enhance and maintain mobility of the corps and to degrade or counter the mobility of the enemy." (59)

This area of corps doctrine strikes the author as being decidedly deficient. How the enemy can be disrupted, his echelons separated and delayed and his operational tempo destroyed by obstacles are never addressed. The concept of denying terrain through massive area obstacles is never considered. Synchronizing obstacles with deep battle fires is not brought forth. No mention is made of the potential usage of atomic demolition munitions emplaced by special forces teams to assist in deep battle operations. Based

on our doctrinal literature, it would appear that corps has little part to play in countermobility operations, and that the burden rests at division level.

It may be appropriate for the corps to give the divisions the majority of the countermobility effort in the close battle area. However, the doctrine needs to consider the potential that obstacles can provide in the deep battle in terms of delaying follow-on echelons, separating echelons being committed from their logistics and possibly from some of their indirect fire support and air defense coverage. Additionally, the corps should be looking for the opportunities to create massive reinforcement obstacles to assist in securing and maintaining defensive areas, and to provide opportunities to regain the initiative and the offensive.

Division level doctrinal literature as embodied in FM 71-100 (approved final draft, November 1988) is a good blend of descriptive and prescriptive writing. Sections on countermobility stress integration with maneuver and other combat support elements to disrupt, block and turn enemy elements, and place some emphasis on the engineer potential in separating enemy echelons in the deep battle.(60) A comprehensive listing of the engineer battalion's missions is provided, and the use of obstacle zones and belts as control measures is discussed.(61)

Obstacle planning is focused mainly on execution by the brigades, with the divisional engineer being the link

between planning at the corps and divisional level and execution by the brigades. Surprisingly, emphasis is more on the need for restricting the emplacement of obstacles in order for division maneuver to be unimpeded than it is on disrupting enemy movement.(62)

While much more detailed than FM 100-5 and FM 100-15, the division operations manual still lacks a larger vision for the use of engineers in the countermobility role. In a lengthy discussion of the covering force battle, the use of engineers garners virtually no notice. The focus is on obstacles and minefields at the brigade and battalion level. How to coordinate those levels into a more effective and unified effort is not well developed. Situations or scenarios showing effective use of obstacle belts and zones are not provided, nor is there sufficient discussion on integrating division obstacles with corps obstacles, other than to say they both appear on the division obstacle overlay.(63) The concept of large area obstacles is not recognized.

Also missing from this manual is any mention of atomic demolition munitions, a key means for creating large obstacles rapidly with minimal manpower. Appendix E covers nuclear operations well, but considers only artillery and air force delivered munitions, and does not consider the engineer as a possible player in the targeting process.

Addressing maneuver doctrine in regards to countermobility at brigade and below is not within the

scope of this study, so attention will now be turned to the engineer literature to see how effectively it supports, augments and is integrated with the maneuver doctrine.

The keystone document for engineer doctrine is FM 5-100, which opens with the engineer challenge: "...turn terrain into an asset for our forces and a weapon against the enemy."(64) To accomplish this, the doctrine establishes five primary engineer functions in a theater of operations: mobility, countermobility, survivability, sustainment engineering and topographic engineering.(65) Our focus will be on countermobility, and to a limited extent, on topographic engineering. The doctrinal manuals being examined along with FM 5-100 are FM 5-102, Countermobility, and FM 5-105, Topographic Operations.

FM 5-100 addresses the nature of the Soviet threat effectively and concisely, highlighting that engineers can be used to disrupt the tempo of Soviet operations.(66) Accomplishing this falls into the realm of countermobility, which FM 5-100 describes as follows:

> Countermobility augments natural terrain with obstacle systems in accordance with the commander's concept. This adds depth to the battle in space and time by attacking the enemy's ability to maneuver his forces. With his movement impeded--disrupted, turned, fixed, or blocked--he is vulnerable to our forces. Engineers advise the commander on the best means to reinforce the natural obstacle value of the terrain and emplace most of the minefields and other obstacles that support the commander's plan. (67)

The topographic engineering assistance to the commander is primarily in providing detailed terrain analysis:

> ...they recommend avenues and routes, obstacle locations, engagement areas, unit positions, and deep operation targets. Topographic engineer units furnish detailed terrain analysis products, maps, and digital terrain data, so that commanders can develop plans that make the best use of terrain. (68)

Having provided background on some of the engineer intents and capabilities, FM 5-100 discusses support of the battlefield in terms of the deep, close and rear battles, the first two being of concern here. In the deep battle,

> ...engineers recommend targets and weapons that take advantage of terrain to isolate the battlefield. (69)

> Deep operations are often conducted with assets other than ground maneuver forces. In these cases, engineers provide terrain analysis to aid the commander in the intelligence preparation of the battlefield. Knowing the impact of terrain on weapons effects, they participate in the target analysis/nomination process to help the commander shape the battlefield. Engineers also provide specific advice on the use of interdiction obstacles and track their status within the commander's area of interest for future operations. (70)

From a maneuver commander's perspective, these quotes are excellent descriptions of what should be done by the engineers. Let's see how well the manuals support and fill them out.

Notice that the quotes above mention the engineer role in targeting and deep battle operations. What you have just read is about as specific as the manuals get in both areas.

For targeting, FM 5-100 does specify that the engineer should work with the G2/S2 and the FSCOORD in "...identifying areas of potential enemy vulnerability and

high-value targets (HVTs)."(71) However, other than general scattered references to bridges and chokepoints, none of the manuals presents a clear sample listing of targets or information on means of attack, attack parameters and benefits that might be gained. While FM 5-100 cites topographic engineers as having targeting input, FM 5-105, Topographic Operations, focuses only on terrain analysis products and does not reflect direct concern with targeting or deep battle operations.

Engineer doctrine addresses involvement in deep operations mostly in terms of interdiction and isolation. The doctrinal method for doing this is almost entirely dependent on scatterable mines.(72) It fails to recognize the limitations of Air Force delivered mines, as previously discussed here, or the limitations of artillery emplaced FASCAM in terms of rounds available, artillery target priorities, the counterfire battle (both fighting it and receiving it) and the lengthy time for firing emplacement. Plus, the obvious range restrictions of current artillery keeps it out of the deep battle arena at corps level and almost entirely out of the division deep battle. In short, the doctrine does not adequately support deep battle operations at the division and corps level.

In support of the close battle, engineer doctrine is far more effectively developed. FM 5-102 does an excellent job of detailing the creation, utilization and impact of obstacles in support of the tactical battle. It is that

same approach which should be utilized in expanding the engineer doctrinal vision to incorporate massive area obstacles for support of both the deep and the close battles.

The large area obstacle concept does receive some recognition in FM 5-102, Countermobility which does recognize the value of flooding to create a large obstacle more than the maneuver or keystone manuals. It does address using this type of obstacle to disrupt enemy tempo and cause him to expend his bridging assets or cross on a narrower frontage, thus fulfilling part of the doctrinal assessment criteria established at the beginning of this section. (73) Such obstacle operations are considered a method of terrain reinforcement (74), and also as an expedient obstacle along with controlled burning of areas. (75) They also fall into the category of denial operations, which are primarily executed to deny the enemy use of anything that could be of benefit, terrain included.

Unfortunately, the primary countermobility manual does not fully develop the use of flooding and terrain denial. While recognizing the benefit of the concept, it does not provide examples of such operations or any detailed information on how to plan and execute them. Interestingly, FM 5-102 states that denial operations are to be planned at corps and division level (76), something that the maneuver manuals and FM 5-100 fail to mention. A sample denial annex is provided in the manual (77), identical to the

sample in FM 101-5-1, Staff Organization and Operations.

The holes in the countermobility manual regarding large area obstacles are partially filled in by FM 5-106, Employment of Atomic Demolitions, by far the best of the engineer manuals on describing and explaining how to execute large area obstacles. Its deficiencies are that it does not address all the effects on delaying the enemy, and since it is ADM specific, does not mention other means of creating massive area obstacles. As noted before, ADM planning and use is not well integrated in our doctrine. Conceivably, this is a result of its use being considered in the same category as tactical nuclear weapons, and the natural reluctance of any host nation or ally to have ADM used on their territory. It may be worthy to reconsider their value, particularly when NATO wargames usually end up going nuclear early. If massive area obstacles could be created to delay second echelons in lieu of tactical nuclear weapons, it might be a reasonable alternative.

To sum up, engineer doctrine does not adequately address the concept of massive area obstacles, and is particularly deficient in regards to engineer operations in support of the deep battle. This may be a result from the engineer philosophy that obstacles by themselves never serve to block an enemy force.(78) Thus, engineer doctrine has become predominantly focused on obstacles that are integrated with maneuver and are covered by direct and indirect fire. That is not incorrect, just narrow. The

higher level doctrine needs to be developed more fully, recognizing that the theoretical concepts of decisive points and centers of gravity are valid, and that they can be created or exploited by engineer operations as in the Roer and Iran-Iraq examples.

This doctrinal deficiency may also be a result of our years of NATO focus, where obstacle plans are so well developed and integrated with the host nation and even considered in peacetime construction projects.

Professional literature has contributed little to the development of the large area obstacle concept. Articles relating to the subject focus on Central European fortifications to offset NATO's numerical inferiority and the surprise element the Soviet's potentially have. Within some of these fortification concepts has been the idea of creating lakes and streams that provide aesthetic and recreational benefits as well as the potential for use in military obstacle operations. As yet, the development of such concepts has not been pursued to the author's knowledge. This stems most likely from the West German reluctance to create any permanent barriers between the two German nations, fearing that it would be a tacit acceptance of permanent division.(79)

VI. Conclusions

Doctrine should be orderly, systematic, and not contradictory. U.S. Army doctrine is orderly and systematic to the extent that we have series of manuals based on functional areas (such as maneuver, engineer, etc.), with each series having a capstone manual with supporting ones to provide greater detail. In the particular doctrinal microcosm that has been studied here, what has been found is that, when probed a bit, the pieces for the concept concerned were found, but that they were not linked together well, nor was the full potential realized.

To make full use of the idea of massive area obstacles requires that the following changes be incorporated into the literature:

a. That the massive area obstacle concept be addressed in FM 100-5, FM 100-15 and FM 71-100, elaborating on how the concept can be incorporated into defensive operations and providing general planning guides.

b. That the methods for execution be fully explained in FM 5-100 and FM 5-102. These explanations should include sample scenarios and planning factors for all relevant systems.

c. That atomic demolition munitions employment be integrated into the above manuals.

d. That area denial operations be integrated into the above manuals.

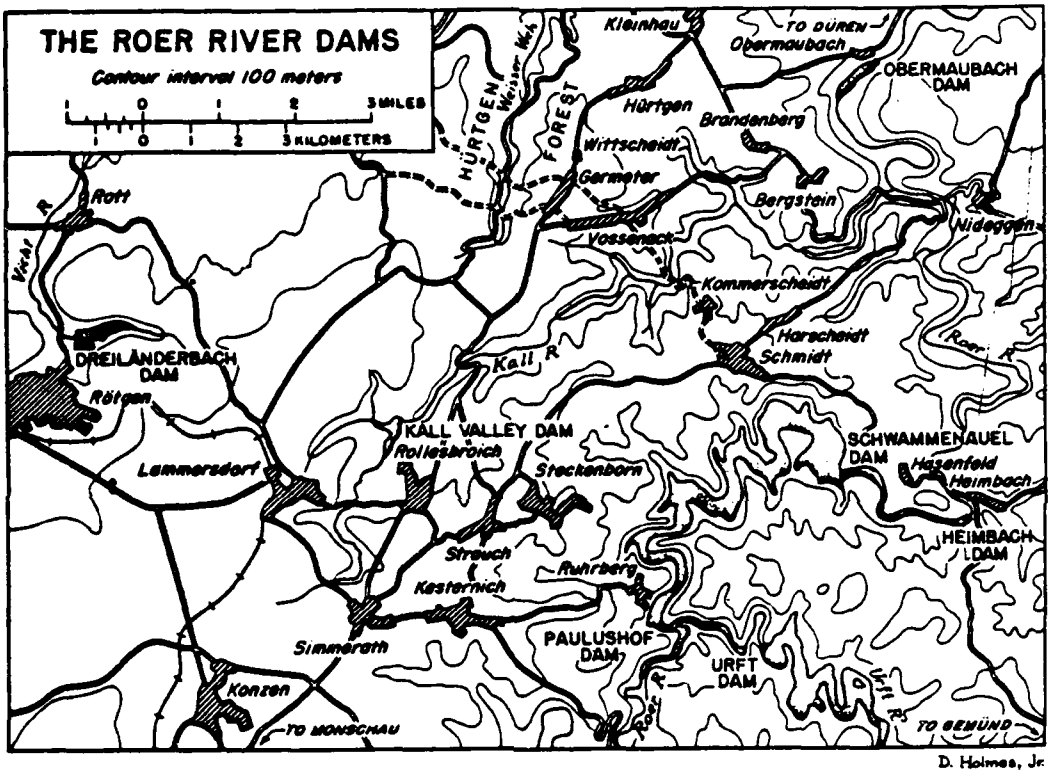
By now the "So What?!" question has probably begun to seriously bludgeon the reader. To close I will attempt to answer that.

Consider that we have only examined the literature, and that force structure, training and equipment have yet to be addressed. All three are affected by the adequacy of the doctrinal literature. Since the concept of massive area obstacles is not developed in the literature, it consequently does not enter into the training of the vast majority of the officers who may be responsible for planning division and corps operations. It is not considered in the tactical instruction at CGSC and has not been brought out in the AMSP tactical exercises.

If not brought out in the literature and training, it is almost certain that the force structure and equipment will not be supportive of the concept. In this regard, the decision to give all ADM responsibility to the Special Forces may be a good example. Divisions and corps now not only have to worry about the problem of obtaining firing release for ADM, but they have to obtain the Special Forces assets to execute the mission. One can easily conceive of situations where that may be more difficult to obtain than the nuclear release. If certainly doesn't ease the planning problems or provide tactical flexibility and responsiveness.

The doctrinal deficiencies that this monograph raises are (fortunately) not earth-shattering. However, this

academic exercise does show that we have a tool that we have largely ignored in our doctrine, and that it would be extremely useful in some situations, particularly when outnumbered and on the defense. If we probe our doctrine in any depth, we will likely find many similar deficiencies in other functional areas and more tools we don't recognize or know how to use. It is sort of like a high school auto-shop class--lots of tools, but the students aren't sure how to use them, and the repair manuals only tell them that the car should run.



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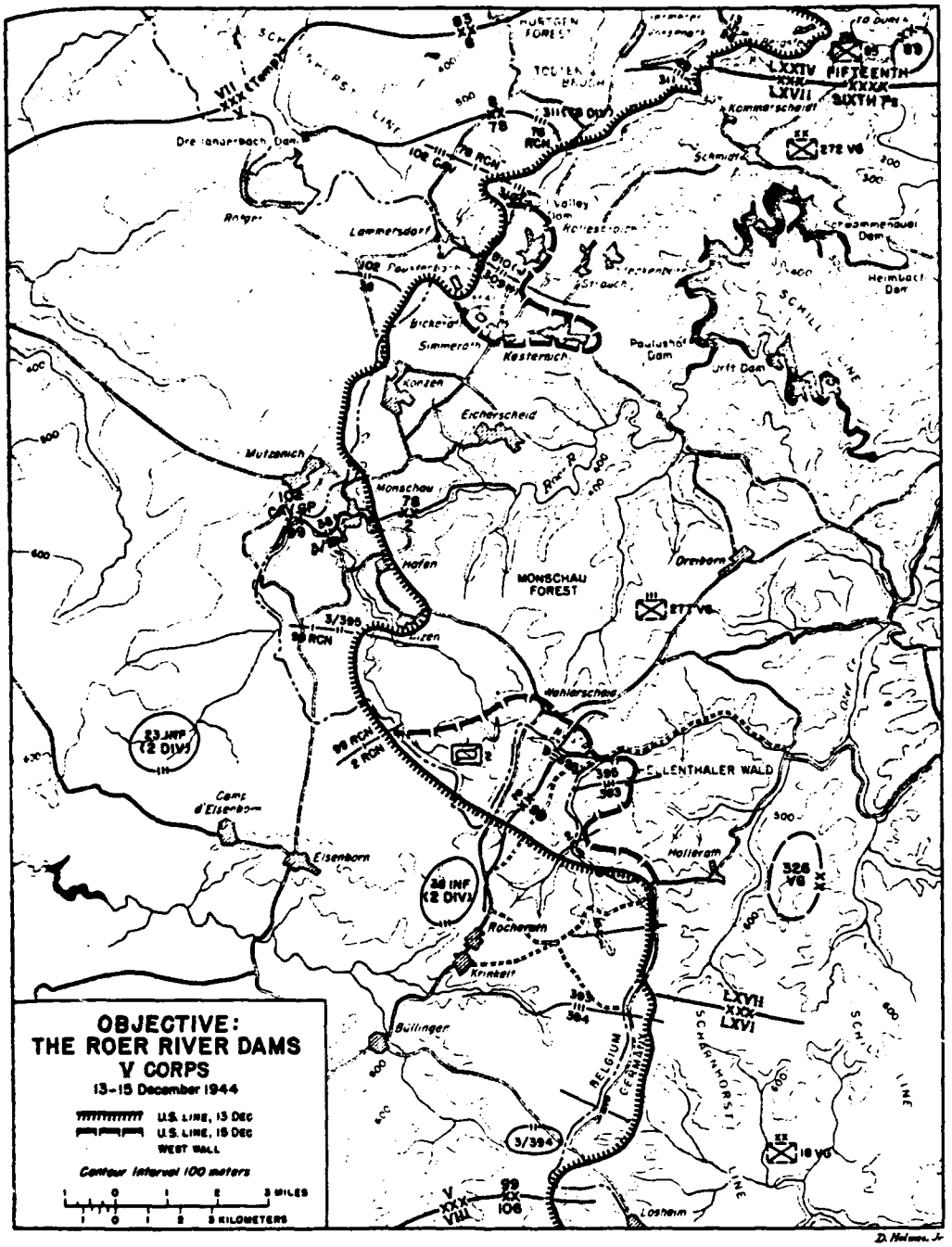

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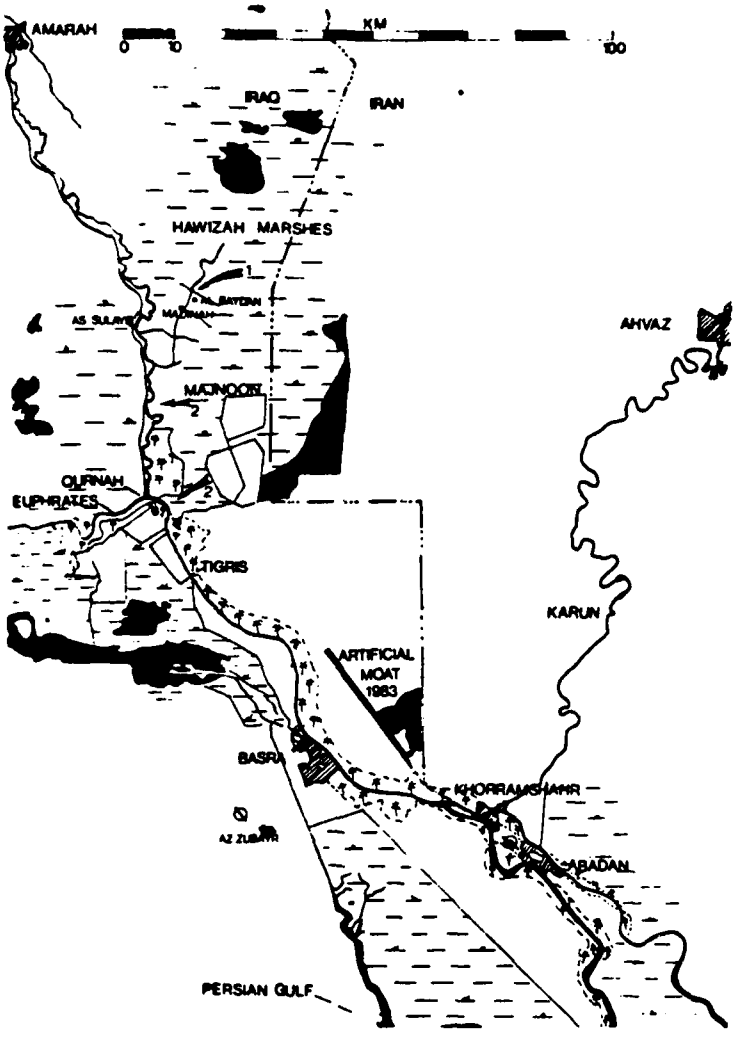

1 = Iranian offensive February 1984; 2 = Iranian offensive, March 1985; Palm trees indicate cultivated area.

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